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ABSTRACT

Computer models have definite limitations regarding the representation of biological systems, but they do have useful applications in reducing the number of animals used to study physiological systems, especially for educational purposes. This guide lists computer models that simulate living systems and can be used to demonstrate physiological, anatomical, pharmacological, and medical concepts. The 48 programs are listed alphabetically and by subject; and an annotated description is given of each, including author, source, price, system requirements, and audience. (SLD)

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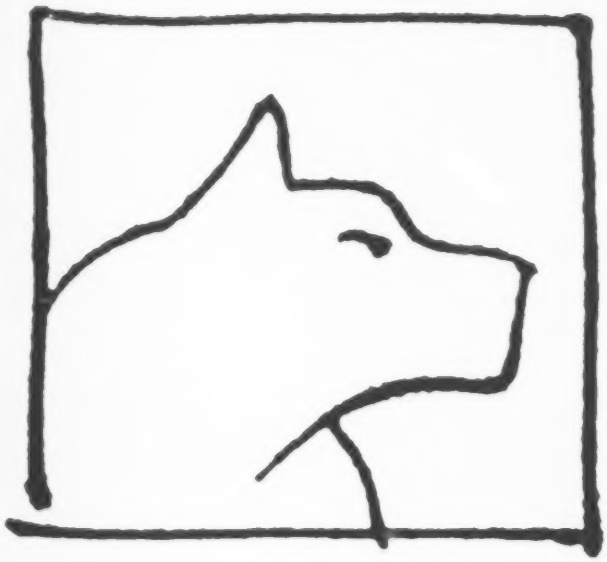
Animal-Related Computer Simulation Programs for Use in Education and Research



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Animal-Related Computer Simulation Programs for Use in Education and Research

AWIC Series #1

Kevin P. Engler
Animal Welfare Information Center

Animal
Welfare

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INTRODUCTION

In 1959 Russell and Burch defined the concept of alternative methods for animal research, testing, and education in terms of the 3 R's: replacement, reduction, and refinement*. Since then, a host of alternative methods have been proposed and among these, computer-assisted modelling. While computer models have definite limitations regarding the representation of a biological system, they do have useful application for reducing the numbers of animals used in some instances, particularly for education.

The computer models comprising this guide simulate living systems and can be used to demonstrate important physiological, pharmacological, anatomical, and medical concepts. All programs in this listing are, or will soon be, available for sale or distribution through the identified sources. Price quotes may vary with market trends and fluctuations in currency exchange rates. Only six of the programs are currently held at the National Agricultural Library (NAL) and these are indicated in the list of titles on pages 2-3. Programs held at NAL may be utilized at the Library by patrons.

The preparer would like to acknowledge the generous assistance of Dr. Richard T. Fosse for contributing descriptions of software with which he has come in contact.

*Russell, W.M.S. and R. L. Burch. The Principles of Humane Experimental Technique. Springfield, IL: Charles Thomas, 1959.

ALPHABETICAL LISTING OF PROGRAM TITLES

001 Advanced Continuous Simulation Language (ACSL)
002 Anatomy of a Bony Fish
003 Anatomy of a Shark
004 Anesthesia and Analgesia of Laboratory Animals
005 Biology Dissection Guides
006 Blood
007 BROODMARE
008 Cardiac Electrophysiology and Pharmacology
009 CARDIOLAB
010 Cardiovascular Function Laboratories
011 Cardiovascular Lab Videodisc Simulation
012 Cardiovascular Pharmacology
013 Cardiovascular Systems and Dynamics
014 CardioVascularCat
015 Tne Case of the Dead Turkeys
016 Cat Superior Cervical Ganglion-Nictitating Membrane Preparation (in vivo)
017 The Digestion Simulator
018 The Effects of Drugs on Neurotransmitter Release in the Enteric Nervous System
019 The Electrocardiogram
020 Exercise Physiology
021 Exercises in Muscle Contraction
022 Experiments in Metabolism
023 Frog Dissection
024 Frog Heart
025 ILEUM
026 The Insect World
027 MacDope
028 MacMan
029 MacPee
030 MacPuf
031 Marine Invertebrates
032 MAXSIM
033 Molecular Basis of Muscle Contraction
034 Muscle Physiology
035 Nerve Physiology
036 Neuromuscular Pharmacology
037 Operation: Frog
038 Pharm Lab
039 PharmaMACokinetix
040 PharmaTutor
041 PharmTools
042 Physiological Simulation Software
043 Sea Lamprey
044 A Simulated Sciatic Nerve-Anterior Tibialis Muscle Preparation
045 Simulations in Physiology-The Respiratory System
046 Smooth Muscle Pharmacology
047 Visifrog
048 The Worm

PROGRAM TITLES BY SUBJECT*

PHYSIOLOGY PROGRAMS:

001 Advanced Continuous Simulation Language (ACSL)
008 Cardiac Electrophysiology and Pharmacology
010 Cardiovascular Function Laboratories
011 Cardiovascular Lab Videodisc Simulation
013 Cardiovascular Systems and Dynamics
014 CardioVascularCat
016 Cat Superior Cervical Ganglion-Nictitating Membrane Preparation (in vivo)
017 The Digestion Simulator
019 The Electrocardiogram
020 Exercise Physiology
021 Exercises in Muscle Contraction
022 Experiments in Metabolism
024 Frog Heart
028 MacMan**
029 MacPee**
030 MacPuf**
033 Molecular Basis of Muscle Contraction
034 Muscle Physiology
035 Nerve Physiology
042 Physiological Simulation Software
046 Simulations in Physiology-The Respiratory System**

PHARMCOLOGY PROGRAMS:

001 Advanced Continuous Simulation Language (ACSL)
004 Anesthesia and Analgesia of Laboratory Animals
008 Cardiac Electrophysiology and Pharmacology
009 CARDIOLAB**
012 Cardiovascular Pharmacology
014 CardioVascularCat
016 Cat Superior Cervical Ganglion-Nictitating Membrane Preparation (in vivo)
018 The Effects of Drugs on Neurotransmitter Release in the Enteric Nervous System
025 ILEUM
027 MacDope**
032 MAXSIM
036 Neuromuscular Pharmacology
038 Pharm Lab
039 PharmaMACokinetix
040 PharmaTutor
041 PharmTools
042 Physiological Simulation Software
044 A Simulated Sciatic Nerve-Anterior Tibialis Muscle Preparation
046 Smooth Muscle Pharmacology

ANATOMY PROGRAMS:

002 Anatomy of a Bony Fish
003 Anatomy of a Shark
005 Biology Dissection Guides
023 Frog Dissection**
026 The Insect World
028 MacMan**
031 Marine Invertebrates
037 Operation: Frog
043 Sea Lamprey
047 Visifrog
048 The Worm

MEDICAL PROGRAMS:

006 Blood
007 BROODMARE
011 Cardiovascular Lab Videodisc Simulation
015 The Case of the Dead Turkeys

*Some programs are listed under more than one category heading

**Held at the National Agricultural Library for use at the Library's demonstration center.

001

PROGRAM: Advanced Continuous Simulation Language (ACSL)

DESCRIPTION: ACSL (pronounced "axle") is a language based on FORTRAN designed to enable the user to mathematically model and analyze the behavior of physical processes described by time dependent, nonlinear/differential equations or transfer functions. The language can be used to create programs which describe and predict physiological or metabolic processes in biological systems, such as the uptake, distribution, metabolism, and elimination of drugs and chemicals in animals. Company literature states "the system can easily by mastered by the novice-no initial training is required", while advanced users have access to additional features. Data output describes models numerically or graphically. Mitchell and Gauthier Associates has available an information package with a demonstration program called Physiological-Based Pharmacokinetic Model Demonstration (PHYSIM). The program demonstrates the ability of ACSL to predict the effect of chemicals in animals and extrapolate the effect in humans. SimuSolv, a computer program developed by Dow Chemical Company allows the user to write and run a program in the ACSL language more efficiently. See: Ramsey, J.C, and M.E. Andersen, "A Physiologically Based Description of the Inhalation Pharmacokinetics of Styrene in Rats and Humans", Toxicology and Applied Pharmacology, 73:159-175, 1984; Nicolaysen, L.C., and J. B. Justice, Jr. "Effects of Cocaine on Release and Uptake of Dopamine In Vivo: Differentiation by Mathematical Modeling", Pharmacology Biochemistry, & Behavior, 31:327-335, 1988.

AUTHOR(S): Unknown

SOURCE: Mitchell & Gauthier Associates, Inc., 73 Junction Square Drive, Concord, MA 01742. Phone: (508) 369-5115.

PRICE: $5,000.00-$39,000.00 (depending on operating system) for 12 month license with additional payments for extension.

SYSTEM REQUIREMENTS: Contact Mitchell & Gauthier Associates.

AUDIENCE: Investigators.

002
PROGRAM: Anatomy of a Bony Fish

DESCRIPTION: The internal organs, external body parts, and skeletal structures of a bony fish are displayed and identified. Word games and multiple choice quizzes help students understand the anatomical structure and function of these fish.

AUTHOR(S): Unknown

SOURCE: Educational Images Ltd., P.O. Box 3456, West Side, Elmira, NY 14905. Phone: (607) 732-1090.

PRICE: $59.95.

SYSTEM REQUIREMENTS: Apple series.

AUDIENCE: High school.

003
PROGRAM: Anatomy of a Shark

DESCRIPTION: The internal organs, external body parts, and skeletal structures of a shark are graphically displayed and identified. Word games and multiple choice quizzes help students understand the anatomical structure and function of sharks.

AUTHOR(S): Unknown

SOURCE: Educational Images Ltd., P.O. Box 3456, West Side, Elmira, NY 14905. Phone: (607) 732-1090.

PRICE: $59.95.

SYSTEM REQUIREMENTS: Apple series.

AUDIENCE: High school.

004
PROGRAM: Anesthesia and Analgesia of Laboratory Animals, versions 1B-25.08.89(H), 1B-25.08.89(P), 1B-25.08.89(S)

DESCRIPTION: This interactive educational program is designed to teach the user aspects of small laboratory rodent (rat, mouse, and guinea pig) anesthesia and analgesia. It covers inhalation, injection, and local anesthesia using common drugs. It includes drug dose calculation modules for sodium pentobarbital, Hypnorm (Innovar-vet), and Hypnorm (Innovar-vet)/Dormicum (Midazolam), the analgesic drug Temgesic (Buprenorfine hydrochloride) as well as use concentration calculation modules for lignocaine. Pain recognition and diagnosis is covered and linked to the use of an analgesic. The program is suitable as a reference source and for self-study. The current version is available in English and Norwegian, but will finally be released in French and German versions as well. Translation software allows study in any of the release languages at any point within the program.

AUTHOR(S): Richard T. Fosse.

SOURCE: Dr. Richard T. Fosse. Laboratory Animal Veterinary Services, University of Bergen, Armauer Hansen's House, Haukeland Hospital, N-5021 Bergen, Norway. (Dr. Fosse may be contacted as an information and lecture source on the use of software and animals in veterinary and medical education. His own list of simulation software is available on Macintosh format diskettes. Readers can obtain his list by sending a formatted Macintosh diskette and $8.00 to cover return postage.)

PRICE: Version 1B-25.08.89(H) $40.00, 1B-25.08.89(P) $45.00 (both available now), 1B-25.08.89(S) Supercard available December 1989.

SYSTEM REQUIREMENTS: MacSE/Plus and SE30; MacII and IIcX. V1B-25.08.89 (H) needs Hypercard v. 1.2 or higher, 1B-25.08.89(P) is supplied with runtime version of PLUS driver.

AUDIENCE: Graduate; professsional.

005
PROGRAM: Biology Dissection Guides

DESCRIPTION: Seven separate programs describe and graphically simulate dissection procedures for the following animals: starfish, earthworm, clam, crayfish, grasshopper, perch, and frog. Color graphics, definitions, and review questions help students understand the anatomical structure and function of these animals.

AUTHOR(S): Unknown

SOURCE: Carolina Biological Supply Company, 2700 York Road, Burlington, NC 27215.

PRICE: Each program $30.00; complete set $190.00.

SYSTEM REQUIREMENTS: Apple II 48K; IBM PC.

AUDIENCE: Grades 7-12.

006
PROGRAM: Blood

DESCRIPTION: This two-part program utilizes both text and graphics to teach the principles of red blood cell indices and blood group determinations without using fresh blood samples. The first part, Red Blood Cell Indices, can simulate a red blood cell count, hematocrit, and hemoglobin concentration for each of the following: normal male, normal female, anemic subject, and unknown. A complete hematological profile can be calculated from the results of these procedures. The second part, Blood Groups, explains the principles of ABO and Rhesus blood groupings. The user can determine the blood group of unknown blood samples.

AUTHOR(S): David Dewhurst and Alan Williams.

SOURCE: Dr. David Dewhurst, Department of Applied Science, Leeds Polytechnic, Calverley Street, Leeds LS1 3HE, U.K.

PRICE: $46.00.

SYSTEM REQUIREMENTS: BBC B, Master (40 or 80 track disk).

AUDIENCE: High school; undergraduate.

007
PROGRAM: BROODMARE, version II

DESCRIPTION: BROODMARE simulates problems encountered by veterinarians who supervise the controlled breeding of mares. The program uses records based on real mares. The breeding history of each mare is displayed and routine clinical observations are presented. Comments are made about estrus behavior and follicular and cervical tone. Ovarian and follicular size is displayed graphically. The program also incorporates treatment or management decisions such as whether or not to administer a treatment, variabilities due to breed, and when to proceed to another examination.

AUTHOR(S): Peter Williamson, Reproductive Studies, School of Veterinary Medicine, Murdoch University, Western Australia 6150, Australia.

SOURCE: Stratem Pty. Ltd., 7 Earlston Place, Western Australia, 6154, Australia.

PRICE: $375.00.

SYSTEM REQUIREMENTS: IBM/MS.DOS with Color Graphics Card.

AUDIENCE: Professional.

008
PROGRAM: Cardiac Electrophysiology and Pharmacology

DESCRIPTION: This program uses five simultaneous traces to represent the electrical activity of the SA node, AV node, right ventricle, and left ventricle and the blood volume for the left ventricle. The traces simulate the following conditions: normal heart function, bradycardia, tachycardia, left vagal stimulation, bundle branch blockage, premature ventricular contractions, digitalis intoxication, and catecholamine stimulation. The program also includes an exercise in which the user attempts to identify four unknown antiarrhythmic agents (Propranolol, Phenytoin, Quinidine, and Verapamil) by their effects on the model.

AUTHOR(S): James R. Walker, Ph.D.

SOURCE: Integrated Functional Laboratory, University of Texas Medical Branch, Galveston, Texas 77550. Phone: (409) 761-2966.

PRICE: Unknown

SYSTEM REQUIREMENTS: IBM compatibles.

AUDIENCES: Graduate; professional.

009
PROGRAM: CARDIOLAB

DESCRIPTION: "CARDIOLAB" simulates cardiovascular pharmacology experiments on anesthetized animals and pithed animals. The program focuses on the "problems of choice of drug, dose size, and order of drug administration". Heart rate and blood pressure traces illustrate the effects of 10 agonists, 12 antagonists, and unknowns. The program also simulates vagal and sympathetic cardiac nerve stimulation. Individual differences due to biological variation are allowed. The effects of blockers "wear off" after time, overdoses "kill" the subject, and the subject may "die" unexpectedly. Unknown drugs may be characterized by the student. NAL Call No.: QA76.8.I2594H8.

AUTHOR(S): Dr. Ian Hughes, University of Leeds

SOURCE: Elsevier-BIOSOFT (JIC), 52 Vanderbilt Avenue, New York, NY 10017.

PRICE: $199.00; $25.00 demonstration version.

SYSTEM REQUIREMENTS: IBM PC (128K); Apple II (48 K); BBC B (40 or 80 track).

AUDIENCE: Graduate; professional.

010
PROGRAM: Cardiovascular Function Laboratories, version 3.0 Pre-release

DESCRIPTION: When completed in 1991, the total package will consist of ten programs. Demonstration copies and full programs are being made available as they are completed. The programs use pressure and volume to help the user understand cardiovascular function. Program titles include the following: Isolated Heart Lab*, Systemic Circulation Lab*, CV Pharmacology Lab, Cardiac Shape Animation, Closed CV Loop*, Cardiac Pathophysiology, Cardiovascular "Plumbing", Reflex "Plumbing", Cardiac Imaging, and Electrophysiology. The programs allow for user interaction with the dynamics of the cardiovascular system. Problems are posed regarding the diagnosis and/or therapy of patients based on case histories. Graphics displays of heart-lung models, systemic circulation models, strip charts, raw data, and curves representing processed data illustrate important physiological concepts. A ten page description of software installation and basic operations accompanies the program. A student text with figures and problem sets will be available in 1991. (*Available 8/89. Contact author concerning availablility of others.)

AUTHOR(S): Nils S. Peterson

SOURCE: Nils S. Peterson, Learning Tools, P.O. Box 3158, Eugene, OR 97403.

PRICE: During pre-release period demo copies $20.00 each, full programs $60.00 each.

SYSTEM REQUIREMENTS: IBM PC with 640K, 8087 math coprocessor, any graphics adapter and monitor; Macintosh (in 1990).

AUDIENCE: Graduate; professional.

011
PROGRAM: Cardiovascular Lab Videodisc Simulation

DESCRIPTION: This instructional system was selected winner of the 1988 Scientific Award by the Hildegard Doerenkamp-Gerhard Zbinden Foundation for a scientific contribution to "Reduction of Animal Use in Biomedical Research by Computer Modelling". It utilizes a laser disk to simulate cardiovascular and respiratory physiology experiments for students of veterinary and human medicine. The menu driven program contains the following chapters: 1) Experimental Preparation and Instrumentation. Shows an anesthetized, intubated dog prepared for recording EKG, carotid artery blood flow, venous and arterial blood pressure, and heart rate. Cannulation of veins and arteries, isolation and ligation of vagal nerves, and isolation of the carotid artery are included; 2) Cardiac Catheterization. Recordings from various parts of a catheterized heart; 3) Autonomic Control. Examines the effects of drugs on autonomic receptors, stimulation of vagal nerves, and baroreceptor reflex; 4) Positive Pressure Ventilation. Illustrates effects of respiration on circulatory function; 5) Manometer Experiments. Measurement of arterial pressure; 6) Fibrillation. Atrial and ventricular fibrillation, cardiac message, and defibrillation are illustrated; 7) Termination. Compares the effects of two methods of euthanasia on the heart; 8) Cardiac Cycle. Records events of the cardiac cycle using polygraph tracings; 9) Abnormal Cardiac Cycle. Polygraph recordings illustrate mitral insufficiency, aortic stenosis, and other conditions; 10) Autonomic Tutorial. Examines the pharmacology related to cholinergic, alpha, and beta receptors.

The videodisc contains about 28 minutes of motion sequences and 400 still frames. A workbook accompanies the program. No previous computer experience is required. Three versions of the program are available: 1) using IBM InfoWindows and an InfoWindows-compatible player the computer text and video appear on one monitor; 2) the computer text and video display can appear separately using two monitors, and 3) the video and computer information can appear on a single RGB/composite monitor using the Pioneer LD-V6000 and LD-V4200 players in a custom overlay version and Matrox version. Other videodiscs scheduled for release in the future include: 1) heart sounds, 2) hemorrhagic shock and transfusion, and 3) respiratory mechanics/gas exchange.

AUTHOR(S): Charles E. Branch, Ph.D.

SOURCE: Charles E. Branch, Ph.D., Department of Physiology and Pharmacology, Interactive Video Project, College of Veterinary Medicine, Auburn University, AL 36849. Phone: (205) 844-5414.

PRICE: $800.00; demonstration package $50.00. Source code $100.00. Authoring language also available.

SYSTEM REQUIREMENTS: Any MS-DOS computer. Program runs on the following systems: IBM Infowindows, Matrox Overlay, Custom Overlay, Dual Monitor, Dummy Videodisc. Requires Pioneer LD-V6000 or LD-V4200 videodisc player and CGA or EGA or VGA graphics adapters.

AUDIENCE: Professional.

012
PROGRAM: Cardiovascular Pharmacology

DESCRIPTION: This program produces tracings to represent arterial pressure, cardiac output, total peripheral resistance, and contractility. The objectives of the computer model are to elucidate the reflex regulation of arterial pressure, the action of neurotransmitters and pharmacologic agents which affect the cardiovascular system, and the interaction of components of the circulatory system. Administration of drugs (acetylcholine, epinephrine, isoproterenol, norepinephrine, angiotensin, atropine, phentolamine, propranolol) and execution of procedures (carotid occlusion, vagal ligation) are simulated. Instructions and laboratory exercises accompany the software.

AUTHOR(S): James R. Walker, Ph.D. and Betty J. Williams, Ph.D.

SOURCE: Integrated Functional Laboratory, University of Texas Medical Branch, Galveston, Texas 77550. Phone: (409) 761-2966.

PRICE: Unknown

SYSTEM REQUIREMENTS: IBM compatibles.

AUDIENCE: Graduate; professional.

013
PROGRAM: Cardiovascular Systems and Dynamics

DESCRIPTION: This program is an earlier version of the "Cardiovascular Function Laboratories" developed by Nils Peterson. The program demonstrates heart-lung-blood function using four separate models in one program on one disk: 1) left ventricular function with changeable filling pressure, heart rate, inotropic strength, and Starling resistor; 2) filling pressure, left and right ventricle inotropic states, and pulmonary capillary resistance are manipulated to study right ventricular function and pulmonary circulation; 3) systemic circulation is simulated to study peripheral resistance, venous compliance, etc.; 4) the heart, lungs and circulatory system are integrated to study the whole system. A 150 page manual accompanies the program.

AUTHOR(S): Nils S. Peterson.

SOURCE: Command Applied Technology, Inc., P.O. Box 511, West 400 Main Street, Pullman WA 99163. Phone: (509) 334-6145.

PRICE: $150.00 single user. Site license discounts.

SYSTEM REQUIREMENTS: IBM compatibility with 512K RAM, 8087 math co-processor, CGA graphics adapter, and color monitor.

AUDIENCE: Graduate; professional.

014
PROGRAM: CardioVascularCat

DESCRIPTION: This simulation is based on experimental observations on the circulatory system of an anesthetized cat. It allows various physiological and pharmacological manipulations. Ten student exercises, read as MacWrite documents, simulate these experiments/situations: AV node block, arterial hypertension treatment using various drugs, treatment of angina pectoris, moderate and severe heart failure, volume expansion, and diuresis. Either graphic or real value displays are possible. See: Greenway, C.A., "Simple Model of the Circulation", The Physiologist, 23:63-67, June 1980.

AUTHOR(S): Philip C. Specht, Ph.D.

SOURCE: University of Puerto Rico School of Medicine, GPO Box 5067, San Juan, Puerto Rico 00936.

PRICE: Unknown

SYSTEM REQUIREMENTS: MacSE/Plus; MacII.

AUDIENCE: Professional (preclinical).

015
PROGRAM: The Case of the Dead Turkeys

DESCRIPTION: Designed for first year veterinary students and veterinary microbiologists, this interactive program permits the user to make a microbiological diagnoses of a specified case history of mortality on a turkey farm. Currently the program involves only Escherichia coli. It covers the case history, sampling, microbiology, antibiogram, and the special characteristics of the organism.

AUTHOR(S): Misra Vikram

SOURCE: Misra Vikram, Associate Professor, Department of Veterinary Microbiology, Western College of Veterinary Medicine, Saskatoon, Saskatchewan, Canada S7N 0W0.

PRICE: Unknown

SYSTEM REQUIREMENTS: IBM/MS.DOS.

AUDIENCE: Professional.

016

PROGRAM: Cat Superior Cervical Ganglion-Nictitating Membrane Preparation (in vivo)

DESCRIPTION: This menu-driven program instructs students on the pharmacology of ganglionic transmission and sympathetically innervated smooth muscle by simulating in vivo experiments on the superior cervical ganglion-nictitating membrane preparation of the cat. Introductory text and graphics provide students with sufficient information to plan experiments. A number of drugs and an unknown can be applied to either the ganglion or the nictitating membrane. Preganglionic nerves can be stimulated to evoke half-maximal contraction or left unstimulated. Contractions are displayed on a continuously scrolling chart recorder. A manual and student workbook accompanies the program.

AUTHOR(S): David Dewhurst and Clint Howells.

SOURCE: Dr. David Dewhurst, Department of Applied Science, Leeds Polytechnic, Calverley Street, Leeds LS1 3HE U.K.

PRICE: $150.00

SYSTEM REQUIREMENTS: IBM compatibles.

AUDIENCE: Undergraduate.

017
PROGRAM: The Digestion Simulator

DESCRIPTION: Color graphics depict the human digestive process. The program covers ingestion, peristalsis, digestion in the stomach and large and small intestines, and nutrient passage into the blood. The user may zoom in on a specific process or stop action completely. A lesson planner and student workbook accompanies the program.

AUTHOR(S): Unknown

SOURCE: Carolina Biological Supply Company, 2700 York Road, Burlington, NC 27215.

PRICE: $55.00.

SYSTEM REQUIREMENTS: Apple II with 48K.

AUDIENCE: Grades 6-12.

018
PROGRAM: The Effects of Drugs on Neurotransmitter Release in the Enteric Nervous System

DESCRIPTION: This program simulates experiments on transmurally stimulated guinea-pig ileum preparation. A student workbook suggests the following experiments: how morphine and clonidine inhibit transmural stimulation; determine the effects of naloxone and phentolamine on transmural stimulation. Program users can select drugs or drug combinations, dosages, and voltage and frequency of the stimulus. Experimental results are continuously displayed by means of a simulated chart recorder.

AUTHOR(S): David Dewhurst and Tony Meehan.

SOURCE: Dr. David Dewhurst, Department of Applied Science, Leeds Polytechnic, Calverley Street, Leeds LS1 3HE U.K.

PRICE: $150.00.

SYSTEM REQUIREMENTS: IBM compatibles.

AUDIENCE: Undergraduate.

019
PROGRAM: The Electrocardiogram

DESCRIPTION: This program simulates electrocardiogram (ECG) records of a human subject to instruct students on the physiological basis of the ECG. The calculation and significance of the cardia vector is explained. Traces are displayed on a scrolling screen which may be frozen to permit measurements and hard-copy printouts to be obtained.

AUTHOR(S): David Dewhurst and Guy Brown.

SOURCE: PAVIC Publications, Sheffield, 36 Collegiate Crescent, Sheffield, England S10 2BP.

PRICE: $46.00

SYSTEM REQUIREMENTS: Master or BBC B (40 or 80 track); Epson or Epson-compatible printer is required for hard-copy printouts.

AUDIENCE: High school; undergraduate.

020
PROGRAM: Exercise Physiology

DESCRIPTION: "Exercise Physiology" simulates some of the important physiological measurements (heart rate, minute ventilation, oxygen consumption, blood lactate) to teach students about cardiac and respiratory performance during exercise. The program shows a subject performing work that is steadily increased until exhaustion. Individual parameters such as age, sex, height, weight, trained/untrained can be selected for each subject. Thus, a student can compare the physiological responses of males and females, young and old subjects, etc. Students can determine lactate concentration using a standard curve they have produced from spectrophotometric absorbance readings. A manual and tutor's guide accompanies the diskette.

AUTHOR(S): David Dewhurst and Tony Meechan.

SOURCE: PAVIC Publications, Sheffield, 36 Collegiate Crescent, Sheffield, England S10 2BP.

PRICE: $46.00

SYSTEM REQUIREMENTS: Master or BBC B (40 or 80 track); Epson or Epson-compatible printer is required for hard-copy printouts.

AUDIENCE: High school; undergraduate.

021
PROGRAM: Exercises in Muscle Contraction

DESCRIPTION: Using animated exercises, this program defines the structure and explores the function of the muscle motor unit. The program explains the importance of ATP in muscle contraction, defines the All or None Principle and refractory period, identifies factors leading to muscle fatigue, and discusses the four types of stimuli (subthreshold, threshold, maximal, and supramaximal). The program also develops myogram tracings which depict the following muscle responses: the single twitch, summation, treppe, and tetanus. An interactive student quiz, quiz editor, and teacher's guide accompany the program.

AUTHOR(S): Unknown

SOURCE: Educational Images Ltd., P.O. Box 3456, West Side, Elmira, NY 14905. Phone: (607) 732-1090.

PRICE: $64.95.

SYSTEM REQUIREMENTS: Apple II series.

AUDIENCE: High school; undergraduate.

022
PROGRAM: Experiments in Metabolism

DESCRIPTION: This series of six programs utilizes color graphics and animation to simulate experiments on the metabolism of the mouse. Program 1 provides basic information about the basal metabolic rate (BMR) including a definition, factors which increase/decrease the BMR, units used to express the BMR, and the effect of thyroxin production on BMR. Programs 2-4 simulate three different experiments which involve the determination of the BMR of a normal, resting mouse and the BMR of a mouse exposed to sustained cold and to caffeine. Program 5 consists of a student quiz which can be reviewed by the instructor. Program 6 permits the user to check the BMR calculations from Programs 2-4.

AUTHOR(S): Unknown

SOURCE: Educational Images Ltd., P.O. Box 3456, West Side, Elmira, NY 14905. Phone: (607) 732-1090.

PRICE: $54.95.

SYSTEM REQUIREMENTS: Apple II.

AUDIENCE: High school.

023
PROGRAM: Frog Dissection

DESCRIPTION: The accompanying manual suggests that "Frog Dissection" should be used as a pre-lab exercise to familiarize the student with the structure and function of the frog and/or as a post-lab self-test. Although the graphics are clear and explanatory, they are less than life-like and therefore the program may be most effective when used in conjunction with actual laboratory activities or a life science text. The program is divided into four sections: 1) an orientation to vocabulary, 2) a presentation of structure and function, 3) a simulated dissection and, 4) a self-test consisting of parts identification, multiple choice, and true-false exercises. NAL Call No.: QA76.8.A662N4.

AUTHOR(S): Larry Newby.

SOURCE: Cross Educational Software, 504 E. Kentucky Ave 71270. Phone: (318) 255-8921.

PRICE: $30.00.

SYSTEM REQUIREMENTS: Apple II (48K); IBM-PC (256K); color monitor helpful but compatible with monochrome.

AUDIENCE: Grades 7-12.

024
PROGRAM: Frog Heart

DESCRIPTION: The program simulates a number of experiments performed on the heart of a pithed frog. The simulated heartbeat is displayed by means of a scrolling screen which depicts a chart recorder. Traces can be paused. Tension and timescales are provided so that the rate and force of the heart's contraction can be estimated. The user can witness the effects of adrenalin, acetylcholine, temperature, ligature of Stannius, and extrasystole compensatory pause on the frog heart. Each experiment includes instructions on how to proceed, suggested measurements to take, and student assignments.

AUTHOR(S): David Dewhurst, Guy Brown, Tony Meehan, and Sally Johnstone.

SOURCE: Dr. David Dewhurst, Department of Applied Science, Leeds Polytechnic, Calverley Street, Leeds LS1 3HE U.K.

PRICE: $150.00 IBM; $46.00 Master, BBC model B.

SYSTEM REQUIREMENTS: IBM compatibles; Master or BBC B (40 or 80 track).

AUDIENCE: High school; undergraduate.

025
PROGRAM: ILEUM, version 2.0

DESCRIPTION: This program simulates the actions of various drugs on the isolated guinea pig ileum. Twelve common agonists and a variety of blockers can be "administered" to the preparation. By randomly selecting any one of 20 unknown drugs it is possible to test the user's skill at identification by experiment. Random elements have been incorporated into the program to simulate biological variability. A chart trace can be printed as a permanent record of output.

AUTHOR(S): Dr. Ian E. Hughes, University of Leeds

SOURCE: Elsevier-BIOSOFT (JIC), 52 Vanderbilt Avenue, New York, NY 10017.

PRICE: $60.00

SYSTEM REQUIREMENTS: IBM PC (128K); Apple II (48 K); BBC B (40 or 80 track).

AUDIENCE: Graduate; professional.

026
PROGRAM: The Insect World

DESCRIPTION: This menu driven program presents information on the anatomy of various types of insects. An "x-ray" view of internal organs and systems is included as well as word games and multiple choice quizzes to help students understand the anatomical structure and function of insects.

AUTHOR(S): Unknown

SOURCE: Educational Images Ltd., P.O. Box 3456, West Side, Elmira, NY 14905. Phone: (607) 732-1090.

PRICE: $59.95.

SYSTEM REQUIREMENTS: Apple series.

AUDIENCE: High school.

027
PROGRAM: MacDope

DESCRIPTION: The program user can "administer" up to four drugs simultaneously to a variety of human patients in order to understand their fates and actions in the body. Physiological parameters and subject variables interact with the selected drug(s). Twenty familiar drugs have been preprogrammed. The program teaches students how patient and drug characteristics and dose levels can influence pharmacokinetic behavior. "Fatal" experiments can be performed. Real time, real value output is displayed on tables and graphs. A detailed manual accompanies the program. NAL Call No.: QA76.8.I2594M34 1987.

AUTHOR(S): C.J. Dickinson, D. Ingram, L. Saunders, K. Ahmed, R.F. Bloch, and G. D. Sweeney.

SOURCE: Oxford Electronic Publishing, Oxford University Press, 200 Madison Avenue, New York, NY 10016.

PRICE: $190.00; site license available.

SYSTEM REQUIREMENTS: IBM PC with 512 KB memory, PC/MS-DOS version 2.0 or later, CGA/EGA or Hercules Graphics Adapter, 8087 or 80287 mathematics coprocessor strongly recommended.

AUDIENCE: Graduate; professional.

028
PROGRAM: MacMan

DESCRIPTION: MacMan presents information on the anatomy and physiology of the circulatory system by illustrating the integrated functioning of the heart, brain, and vasculature. Using real time output in tabular and graphic displays, students can witness cardiogenic shock, hemorrhagic shock, pulmonary edema, and the effects of noradrenaline and adrenaline. "Fatal" experiments can be performed. A detailed manual accompanies the program. NAL Call No.: QA76.8.I2594M35 1987.

AUTHOR(S): C.J. Dickinson, D. Ingram, L. Saunders, K. Ahmed, R.F. Bloch, and G. D. Sweeney.

SOURCE: Oxford Electronic Publishing, Oxford University Press, 200 Madison Avenue, New York, NY 10016.

PRICE: $150.00; site license available.

SYSTEM REQUIREMENTS: IBM PC with 512 KB memory, PC/MS-DOS version 2.0 or later, CGA/EGA or Hercules Graphics Adapter, 8087 or 80287 mathematics coprocessor strongly recommended.

AUDIENCE: Graduate; professional.

029
PROGRAM: MacPee

DESCRIPTION: MacPee illustrates the interaction between circulation, kidneys, body fluid, and electrolyte compartments. Tabular values report plasma sodium, potassium, urea, creatinine, albumin and hemoglobin concentrations, packed cell volume, right atrial pressure, body weight, water and solute excretion, total body water, lean body mass, cardiac output, etc. Students can observe the effects of diabetes insipidus, renal leak of albumin, large hemorrhage, reduction of cardiac performance, water loads, and other physiological situations. Experimental time spans simulate hours or days. "Fatal" experiments can be performed. Real time, real value output is displayed on tables and graphs. A detailed manual accompanies the program. NAL Call No.: QA76.8.I2594M36 1987.

AUTHOR(S): C.J. Dickinson, D. Ingram, L. Saunders, K. Ahmed, R.F. Bloch, and G. D. Sweeney.

SOURCE: Oxford Electronic Publishing, Oxford University Press, 200 Madison Avenue, New York, NY 10016.

PRICE: $190.00; site license available.

SYSTEM REQUIREMENTS: IBM PC with 512 KB memory, PC/MS-DOS version 2.0 or later, CGA/EGA or Hercules Graphics Adapter, 8087 or 80287 mathematics coprocessor strongly recommended.

AUDIENCE: Graduate; professional.

030
PROGRAM: MacPuf

DESCRIPTION: Lungs, airways, pulmonary circulation, and gas exchange are modeled in this program in order to examine the major functions of the respiratory system. Lungs and airways are simulated in mechanical terms and pulmonary circulation and gas exchange are simulated with a three-compartment model. The model tracks the flow of oxygen into and carbon dioxide out of venous blood, and monitors the transfer of gases between blood and tissues. The program reports oxygen and carbon dioxide dissociation curves, temperature, barometric pressure, hemoglobin, packed cell volume, pH, and bicarbonate concentration. Students can witness shock, heart failure, hypoxia, breathlessness, cardiopulmonary resuscitation, and the use of blood gas measurements. "Fatal" experiments can be performed. Real time, real value output is displayed on tables and graphs. NAL Call No.: QA76.8.I2594M33 1987.

AUTHOR(S): C.J. Dickinson, D. Ingram, L. Saunders, K. Ahmed, R.F. Bloch, and G. D. Sweeney.

SOURCE: Oxford Electronic Publishing, Oxford University Press, 200 Madison Avenue, New York, NY 10016.

PRICE: $190.00; site license available.

SYSTEM REQUIREMENTS: IBM PC with 512 KB memory, PC/MS-DOS version 2.0 or later, CGA/EGA or Hercules Graphics Adapter, 8087 or 80287 mathematics coprocessor strongly recommended.

AUDIENCE: Graduate; professional.

031
PROGRAM: Marine Invertebrates

DESCRIPTION: Color graphics identify and describe the anatomical structures of a sponge, sea anemone, clam and starfish. Word games and multiple choice quizzes help students learn the structure and function of these marine invertebrates.

AUTHOR(S): Unknown

SOURCE: Educational Images Ltd., P.O. Box 3456, West Side, Elmira, NY 14905. Phone: (607) 732-1090.

PRICE: $59.95.

SYSTEM REQUIREMENTS: Apple series.

AUDIENCE: High school.

032

PROGRAM: MAXSIM, version 4.0 (MS-DOS compatibles) and 1.0 (Macintosh)

DESCRIPTION: MAXSIM is a simulation program designed to teach students, medical professionals, toxicologists, and veterinarians principles of pharmacokinetics and clinical pharmacology. It simulates linear and non-linear physiological, compartmental, pulmonary, and placental models. Variables such as blood flow, organ volumes, absorption rate, partition coefficient, intrinsic clearance, Michaelis-Menten terms, intrinsic activity, potency, single or multiple dosing, dosing intervals, and routes of administration (i.v. bolus, i.v. infusion, oral) can be manipulated by the user. The program permits calculation of the terminal half-life, Cmax, Cmin, effect vs concentration plots, and urinary excretion as a fraction of dose. Results can be displayed and printed graphically or numerically. The programs are not copy protected and have been installed at 200 universities and drug companies.

AUTHOR(S): Johan L. Gabrielsson and Stefan Isaksson.

SOURCE: Johan L. Gabrielsson, Ph.D., Firma Biopharmacon, Geijersgatan 42, S-75226 Sweden. Phone: +0046-18-174303.

PRICE: $95.00.

SYSTEM REQUIREMENTS: IBM PC and compatibles using CGA, EGA, MCGA, VGA, or Hercules graphics adapters; Apple MacIntosh SE and II.

AUDIENCE: Graduate; professional.

033
PROGRAM: Molecular Basis of Muscle Contraction

DESCRIPTION: This program uses animated graphics and step-by-step explanations to teach students about muscle structure, contraction, and control. The package covers the structure of smooth, cardiac, and skeletal muscle, myofibril banding, ATP structure and hydrolysis, actin and myosin, and the molecular basis of contractions. It also includes a sliding filament model. Instructors' and students' notes accompany the package. The average working time is approximately 45 minutes.

AUTHOR(S): A.G. Booth.

SOURCE: Oxford Electronic Publishing, Oxford University Press, 200 Madison Avenue, New York, NY 10016.

PRICE: $90.00 IBM; $45.00 BBC Microcomputer.

SYSTEM REQUIREMENTS: IBM-PC or IBM PS/2 with 128 K RAM, DOS 2.0 or later, and CGA/EGA; BBC Microcomputer.

AUDIENCE: High school; undergraduate.

034
PROGRAM: Muscle Physiology

DESCRIPTION: This program illustrates physiological properties of muscles and nerves by simulating experiments on a frog sciatic nerve-gastrocnemius preparation. The following experiments/ conditions are included: stimulus-strength/response, effect of second stimulus, tetanus, effect of curare, length-tension relationship. A facsimile of an oscilloscope screen displays tracings from which measurements can be taken. Each experiment includes instructions and student assignments. Hard-copy printouts are possible with a compatible printer. A manual tutor's guide and student workbook accompany the program.

AUTHOR(S): David Dewhurst, Guy Brown, Tony Meehan, and Sally Johnstone.

SOURCE: Dr. David Dewhurst, Department of Applied Science, Leeds Polytechnic, Calverley Street, Leeds LS1 3HE U.K.

PRICE: $150.00 IBM version; $46.00 Master, BBC B versions.

SYSTEM REQUIREMENTS: IBM compatibles; Master, BBC model B, Master (40 or 80 track).

AUDIENCE: High school; undergraduate.

035
PROGRAM: Nerve Physiology

DESCRIPTION: "Nerve Physiology" simulates standard experiments performed on the frog sciatic nerve preparation including: stimulus voltage-response, refractory period, conduction velocity, effect of temperature, and effect of local anesthetic (procaine). Using oscilloscope-like tracings to simulate nerve properties/activities, students can make direct measurements from the screen. Students can manipulate voltage and timescales. Each experiment includes instructions and student assignments. Hard-copy printouts are possible with a compatible printer (Epson). A manual tutor's guide and student workbook accompany the program.

AUTHOR(S): David Dewhurst, Tony Meehan, Sally Johnstone, and Megan Quentin-Baxter.

SOURCE: Dr. David Dewhurst, Department of Applied Science, Leeds Polytechnic, Calverley Street, Leeds LS1 3HE U.K.

PRICE: $150.00 IBM, Apple-Macintosh (Hypercard) versions; $46.00 BBC, Master versions.

SYSTEM REQUIREMENTS: IBM compatibles; Apple-Macintosh (Hypercard); BBC model B/Master (40 or 80 track).

AUDIENCE: High school; undergraduate.

036
PROGRAM: Neuromuscular Pharmacology

DESCRIPTION: This menu-driven program represents a number of experiments performed on the sciatic nerve-tibialis anterior muscle of the cat and is designed to illustrate the action of depolarizing and non-depolarizing neuromuscular blocking agents. The first two sections explain the physiological and pharmacological principles of neuromuscular transmission. The third section simulates experimental results via a chart recorder display. The program illustrates the effects of anticholinesterase, a competitive blocker, a depolarizing blocker, and tetanus. The package includes student assignments and record booklets.

AUTHOR(S): David Dewhurst, Guy Brown, Tony Meehan, and Godfrey Collins.

SOURCE: Dr. David Dewhurst, Department of Applied Science, Leeds Polytechnic, Calverley Street, Leeds LS1 3HE U.K.

PRICE: $150.00 IBM; $60.00 Master, BBC model B.

SYSTEM REQUIREMENTS: IBM compatibles; BBC B, Master (40 or 80 track).

AUDIENCE: Undergraduate.

037
PROGRAM: Operation: Frog

DESCRIPTION: "Operation: Frog" introduces young students to the fundamentals of biology and anatomy using simulated frog body parts and systems. Users select proper instruments (surgical scissors, probe, forceps, tweezers, and magnifying glass) to probe, snip, remove, and magnify organs. A puzzle exercise requires students to reconstruct a frog by sequentially replacing organs. The program provides diagrams and animated sequences, error messages for correcting mistakes, and a help key for guidance. The full package also contains a teaching guide with activities, background information, worksheets, and backup disk.

AUTHOR(S): Unknown

SOURCE: Scholastic Inc., PO Box 7502, 2931 East McCarty Street, Jefferson City, MO 65102-9968.

PRICE: $79.95 teacher's edition; $20.00 disk only.

SYSTEM REQUIREMENTS: Apple (64K); Commodore (64K); joystick or mouse optional.

AUDIENCE: Grades 5-10.

038
PROGRAM: Pharm Lab, VAX/VMS version V4.6

DESCRIPTION: Pharm Lab is a four part interactive exercise designed to simulate pharmacological experiments on an anesthetized cat. Lab 1 utilizes tracings of systolic, diastolic, and pulse pressures to demonstrate the effects of various agents on the sympathetic nervous system including epinephrine, norepinephrine, isoproterenol, histamine, phentolamine, propranolol, angiotensin, and tripelennamine. Lab 2 examines the pharmacology of the parasympathetic nervous system by observing the effects of acetylcholine, neostigmine, atropine, hexamethonium, nitroglycerin, and the cardiac glycosides on blood pressure and smooth muscle. Students are quizzed throughout Labs 1 and 2 on the pharmacological effects of the various agents. Labs 3 and 4 test the user on information learned in the first two labs by presenting the various agents as unknowns and requiring the student to identify the unknown via known agonists and antagonists.

AUTHOR(S): G. Read and R. Hino.

SOURCE: George W. Read, Ph.D., Professor of Pharmacology, Pharmacology Department, University of Hawaii, Honolulu, HI 96822.

PRICE: For pricing on VAX PILOT version contact author; for Turbo PASCAL version contact CATS Consortium, Pharmacology Deptartment, University of Kansas, Kansas City, KS 66160.

SYSTEM REQUIREMENTS: VAX PILOT; IBM Turbo PASCAL.

AUDIENCE: Professional.

039
PROGRAM: PharMACokinetix, version 1.91

DESCRIPTION: A basic pharmacokinetics simulation program for veterinary and biomedical students, this program utilizes the following changeable parameters to study drug concentration/time profiles: body distribution, half life, absorption rate, dose, fraction absorbed, dosing interval, start dose number, and end dose number. Absorption model, IV bolus model, and IV infusion model are also options. The drug list includes acetaminophen, ampicillin, aspirin, carbamazepine, diazepam, digoxin, gentamicin, hydrochlorothiazide, lithium, morphine, nitroglycerin, phenobarbital, propranolol, theophylline, and warfarin. Data for new drugs can be entered and stored easily. Graphic displays of concentration/time curve and value calculation are automatic. Curves can be superimposed. The help menu and tutorial are detailed.

AUTHOR(S): Art Straughn and Russ Rackley.

SOURCE: Department of Pharmaceutics, 874 Union Avenue, Memphis, TN 38163.

PRICE: Public domain.

SYSTEM REQUIREMENTS: MacSE/Plus (512K); MacII.

AUDIENCE: Graduate; professional.

040
PROGRAM: PharmaTutor, version 3.0

DESCRIPTION: This graphics-based interactive program consists of five short class exercises which simulate pharmacological experiments on live animals or isolated organs. It is accompanied by a set of written exercises which highlight the most important concepts. The exercises simulate the following: a) dose-effect relationships on smooth muscle in an organ bath; b) effects of catecholamines on pulse and blood pressure; c) neuro-muscular physiology on an isolated diaphragm; d) effects of acetylcholine and a ganglion blocker on circulation: e) effects of various modes of drug administration including oral, i.v., i.v. bolus, and infusion. Visual representations of animals, organ systems, instrumentation, and curve profiles help to stimulate learning. Previous computer experience is not necessary. English and German versions are available.

AUTHOR(S): Daniel Keller and Wofgang Hopff, U of Zurich.

SOURCE: FFVFF, Biberlinstr. 5, 8032, Zurich, Switzerland. Phone: 01 55 70 70.

PRICE: $152.00 regular; $98.00 universities or non-profit groups.

SYSTEM REQUIREMENTS: MacSE/Plus; MacII; MS-DOS/IBM (AT 286, 386, PS/2) with mouse and hard disk.

AUDIENCE: Graduate; professional.

041
PROGRAM: PharmTools, version 0.7

DESCRIPTION: "PharmTools" is a pharmacokinetics tutorial program designed to study one compartment models. Either IV or oral administration can be selected for either single or multiple doses. Automatic aid functions ensure that the correct parameters are entered and that values are within the expected range. Fatal doses can be calculated. On-line help is available and detailed. A drug library module is in process.

AUTHOR(S): Jeff R. Wilcke, Neal Bataller, and Carl Osborne.

SOURCE: Jeff R. Wilcke, DVM, MS, Virginia Polytechnic Institute, Blacksburg, VA 24061.

PRICE: Public domain.

SYSTEM REQUIREMENTS: MacSE/Plus; MacII; Hypercard version 1.2 or lower.

AUDIENCE: Graduate; professional.

042
PROGRAM: Physiological Simulation Software

DESCRIPTION: This collection of five simulation programs teaches concepts of physiology and pharmacology using tabular and graphic displays. 1) The Human tracks changes in over 200 variables following alterations in over 50 parameters to demonstrate the interactions of the cardiovascular, respiratory, renal and temperature regulatory systems. It simulates the physiological effects of such conditions as hemorrhage, temperature stress, exercise, inspired carbon dioxide, and left ventricle failure. 2) Basic Electrophysiology covers axon membrane ion forces, conductances, currents, electric potential, and the summation of single channels. The program is accompanied by a demonstration disk illustrating threshold, summation, accommodation, voltage clamp, and spike train. 3) Basic Cardiovascular utilizes pressure-volume loops, the Windkessel model, and the QRS complex to demonstrate the mechanical factors involved in normal cardiovascular function. 4) Basic Pharmacokinetics illustrates how plasma concentrations are influenced by dose, dose interval, chemical nature, absorption and elimination rates, and volumes of distribution. The program includes both single and double compartment models. 5) Basic Acid-Base demonstrates how metabolic, carbon dioxide, and ventilatory changes regulate blood pH. The program and accompanying material also cover the Henderson-Hasselbalch equation and the Davenport diagram.

AUTHOR(S): Dr. James E. Randall and Dr. Tom Coleman.

SOURCE: Dr. James E. Randall, 609 S. Jordan, Bloomington, IN 47401. Phone: (812) 855-1574.

PRICE: $60.00 complete set.

SYSTEM REQUIREMENTS: IBM-PC with 512K and CGA adaptor.

AUDIENCE: Undergraduate; graduate; professional.

043
PROGRAM: Sea Lamprey

DESCRIPTION: The life cycle and anatomy of a sea lamprey are presented using color graphics. Word games and multiple choice quizzes help students understand the anatomical structure and function of the lamprey.

AUTHOR(S): Unknown

SOURCE: Educational Images Ltd., P.O. Box 3456, West Side, Elmira, NY 14905. Phone: (607) 732-1090.

PRICE: $59.95.

SYSTEM REQUIREMENTS: Apple series.

AUDIENCE: High school.

044

PROGRAM: A Simulated Sciatic Nerve-Anterior Tibialis Muscle Preparation

DESCRIPTION: This model is designed to provide the user with experience in characterizing neuromuscular blocking agents and knowledge of neuromuscular pharmacology. Twitch responses simulating the effects of 0.05 Hz, 0.5 Hz, or 30 Hz for 5 sec supramaximal stimulation are displayed continuously using a series of calibration bars. Drugs can be "administered" in any dose specified by the user. The effect of a drug may be interrupted or allowed to "wear off" rapidly or gradually. The available drugs include: triethylcholine, choline, tubocurarine, pancuronium, gallamine, fazadinium, atracurium, dantrolene, succinylcholine, decamethonium, neostigmine, edrophonium, physostigmine, hexamethonium, atropine, 4-aminopyridine, acetylcholine, and carbacnol. Unknown drugs are selected by the program for the user to characterize. Experimental design, amount and sequence of dosing, and administration time are determined by the user. Screen and printer outputs available.

AUTHOR(S): Dr. Ian Hughes, University of Leeds.

SOURCE: Pidata, The Old Vicarage, Church Lane, Horsforth, Ieeds, England LS18 5LA.

PRICE: $300.00

SYSTEM REQUIREMENTS: IBM; BBC B.

AUDIENCE: Graduate; professional.

045
PROGRAM: Simulations in Physiology-The Respiratory System

DESCRIPTION: This set of 12 simulations allows students to test their understanding of various aspects of respiratory physiology. The programs are divided into four major categories: mechanics, general gas exchange, ventilation-perfusion relationships, and acid-base balance. The programs use pictorial outputs to provide students with a conceptual aid, a description of where values are measured, or a description of the model and how it is solved. A very complete laboratory manual providing students with suggested procedures, axes on which to plot data, and questions to help interpret data accompanies the program. See: Modell, H.I., A.J. Olszowka, and L.E. Farhi. Physiology Teaching Through Computer Simulations-Problems and Promise. Physiology Teacher. 3(3):14-16, 1974 and Modell, H.I., A.J. Olszowka, J.L. Plewes, and L.E. Farhi. Role of computer graphics in simulations for teaching physiology. The Physiologist, 26(2):93-95, 1983. NAL Call No.: QA76.8.I2594M6

AUTHOR(S): Harold I. Modell, Ph.D.

SOURCE: National Resource for Computers in Life Science Education (NRCLSE), P.O. Box 51187, Seattle, WA 98115-1187.
Phone: (206) 548-6244

PRICE: $100.00.

SYSTEM REQUIREMENTS: IBM-PC with MS-DOS version 2.0 or higher, CGA graphics; Apple II family; Macintosh with Microsoft BASIC.

AUDIENCE: Undergraduate; graduate; postgraduate; professional.

046
PROGRAM: Smooth Muscle Pharmacology

DESCRIPTION: This program examines the effect of estrogen on uterine activity and responsiveness to drugs, and simulates the effect of drugs on intestinal smooth muscle. Two concentrations of oxytocin, antidiuretic hormone, and prostaglandin F2a can be administered to tissue from a normal or pregnant rabbit uterus or to gut tissue. Unknown drugs (clonidine, epinephrine, acetylcholine, and isoproterenol) can be identified by their effects on the tissue samples. Clear instructions accompany the program.

AUTHOR(S): James R. Walker, Ph.D. and Odd S. Steinsland, Ph.D.

SOURCE: Integrated Functional Laboratory, University of Texas Medical Branch, Galveston, TX 77550. Phone: (409) 761-2966.

PRICE: Unknown

SYSTEM REQUIREMENTS: IBM compatibles.

AUDIENCE: Graduate; professional.

047
PROGRAM: Visifrog

DESCRIPTION: Color graphics are used to display anatomical structures of the frog including musculature, digestive system, nervous system, cardiovascular system, urogenital system, and skeleton. The program is designed to help students identify anatomical structures and match structure with function. The Lab Pack includes five program disks, teacher's manual, and student worksheets.

AUTHOR(S): Unknown

SOURCE: Carolina Biological Supply Company, 2700 York Road, Burlington, NC 27215.

PRICE: $39.95-$49.95 (depending on hardware); Lab Pack $79.95-89.95.

SYSTEM REQUIREMENTS: Apple II; IBM PC; Macintosh.

AUDIENCE: High school; undergraduate.

048
PROGRAM: The Worm

DESCRIPTION: The structure and function of earthworm anatomy is illustrated using color graphics. The program covers the digestive, nervous, circulatory, reproductive, and locomotive systems. The following features are included: word game for identifying anatomical structures, data retrieval for accessing specific information, and matching test of structure and function. The Lab Pack contains five disks, teacher's guide, and student worksheets.

AUTHOR(S): Unknown

SOURCE: Carolina Biological Supply Company, 2700 York Road, Burlington, NC 27215.

PRICE: IBM PC $49.95, Lab Pack $89.95; Macintosh $49.95, Lab Pack $89.95; Apple II $39.95, Lab Pack $79.95.

SYSTEM REQUIREMENTS: IBM PC; Apple II with 48K; Macintosh.

AUDIENCE: High school; undergraduate.